1. Use for the Intended Purpose

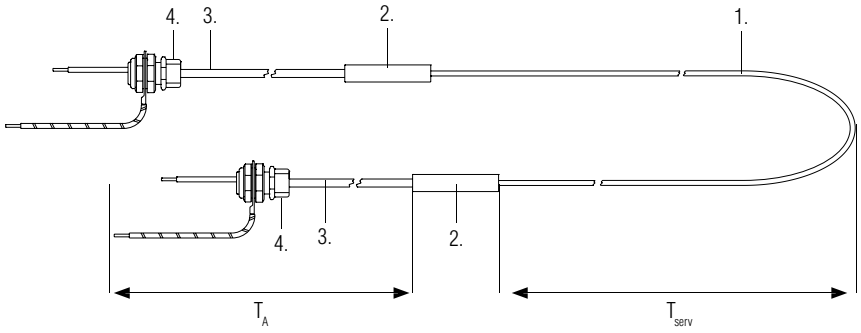
The laser-welded single-core mineral-insulated heating circuit type 27-3641-.2../…./…. forms a mineral-insulated, water-proof, electric sheath heating with a sheath material made of 1.4541 or 2.4816. These heating circuits are used for heating and maintaining a constant temperature in pipes, containers and similar equipment.

2. Product Description

EMK heating cable

1. Heating conductor
2. Magnesium oxide insulation (MgO)
3. Outer sheath

EMK heating circuit



1. EMK heating cable
2. Connection sleeve
3. Cold lead
4. Cable gland

The operating temperatures that can be reached depend not only on the heating circuit output but also on the following operating conditions and can influence them:

- thermal conductivity of the material to be heated,
- thermal conductivity of the medium to be heated,
- type and strength of the insulation and its values.

The heating circuits in this series can be used for a regulated operating state up to 650 °C at the heating conductor.

Resistance to chemicals:

The outer sheath made of VA 1.4541 or 2.4816 can be used in many cases but its utilisation is only conditional where there are chemical liquids and gases. Before commissioning the heating circuit, the owner/managing operator must check this utilisation condition.

3. Marking and Safety Instructions

Marking

Particularly important points in these instructions are marked with a symbol:

DANGER

DANGER draws attention to a danger which will lead to death or serious injury if not avoided.

WARNING

WARNING draws attention to a danger which can lead to a death or serious injury if it is not avoided.

CAUTION

CAUTION draws attention to a danger which can lead to an injury if it is not avoided.

NOTICE

ATTENTION draws attention to measures to prevent damage to property.

Note

Important instructions and information on effective, economical and environmentally compatible handling.

Safety Instructions

- Before commissioning, please check the marking on the heating circuit to make sure that it is suitable for the intended usage.
- When using electrical equipment, die relevant installation and operating regulations must be complied with (e.g. Directive 1999/92/EC, Directive 94/9/EC, EN 60079-0, EN 60079-14, EN 60079-30-2, EN 61241-0 or EN 61241-14 and the DIN VDE 0100 series or other relevant national regulations).
- Installation should be performed by a qualified electrician who has done additional training for electric trace heating systems in hazardous areas. It is essential to follow the directions in the operating instructions provided by the manufacturer.
- All generally applicable statutory regulations and other binding directives relating to workplace safety, accident prevention and environmental protection must be adhered to.
- An incorrect installation of the trace heating and the neighbouring system parts or damage to the heating circuit can cause short-circuiting and the risk of fire during operation.
- The owner/operating manager of an electric system in a hazardous area must keep the operating equipment in good condition, operate it correctly, monitor it and do the required maintenance and repairs.

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4. Guidelines for handling heating circuits

Note

4.1. Storage

- The EMK heating circuits must be stored in protected, clean and dry areas.
- It must be ensured that the heating circuit is protected from mechanical damage and atmospheric influences.
- The storage temperature must be between -20 °C and +60 °C.

4.2. Handling

- The following points must be observed when unrolling:
  - Avoid excessive pulling.
  - Avoid bending and crushing the cables.
  - Do not step on the heating circuit or use it as a climbing loop.
  - To prevent damage to the insulation, particular care must be taken with sharp corners and edges, such as for example on flanges or retaining devices.
  - It is not permissible to drive over the cables with vehicles or auxiliary means of transport.
- It is not permissible to have heating circuits cross over or be in contact with each other because this can increase the temperature beyond the limit or max. permissible operating temperature.

5. Mounting and Installation

Note

5.1. Installation Instructions

- The surface of the object to be heated must be dry and clean.
- Check the intended operating voltage.
- The temperature must not drop below the minimum installation temperature.
- The cables must not be painted over.
- The minimum bending radius must be observed.
- The minimum installation spacing must be observed.

CAUTION

When installing the laser-welded heating circuits, make sure that they do not cross over or touch each other as they could then overheat or cause fires.

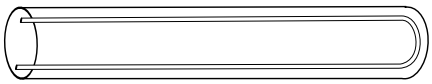
5.2. Inspection before Mounting

- Before starting to install a heating circuit, measure the insulation resistance.
- On the basis of the resistance measurement check if the supplied heating circuit conforms to the project planning.

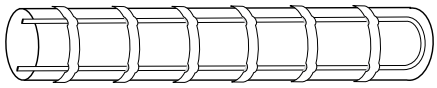
5.3. Installing the heating circuit

Depending on conditions, the heating circuit can be placed longitudinally along the object to be heated or wound spirally around it.

The heating circuit should be laid longitudinally along the pipe in order to improve heat conductivity.



EMK heating circuits are fixed in position with stainless-steel fixing straps or cable ties.

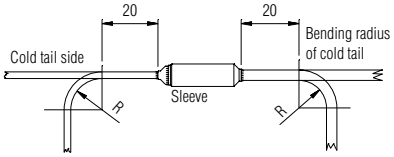


When installing, the minimum bending radius relative to the outer diameter of the heating cable must be observed:

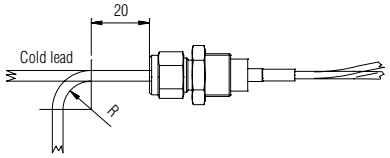
Short designation	**Resistance** [Ω/ **km**]	**Outer diameter Heating cable**	**Bending radius**
EMK VA 010K NiCr	10000	3.2 mm	16 mm
EMK VA 6300 NiCr	6300	3.2 mm	16 mm
EMK VA 4000 NiCr	4000	3.2 mm	16 mm
EMK VA 2500 NiCr	2500	3.6 mm	18 mm
EMK VA 1600 NiCr	1600	3.8 mm	20 mm
EMK VA 1000 NiCr	1000	4.1 mm	21 mm
EMK VA 630 NiCr	630	4.5 mm	23 mm
EMK VA 400 NiCr	400	5.0 mm	25 mm
EMK VA 250 NiCr	250	5.6 mm	28 mm
EMK VA 160 NiCr	160	6.5 mm	33 mm
EMK VA 1600 CuNi	1600	3.2 mm	16 mm
EMK VA 1000 CuNi	1000	3.4 mm	17 mm
EMK VA 630 CuNi	630	3.7 mm	18.5 mm
EMK VA 400 CuNi	400	4.0 mm	20 mm
EMK VA 250 CuNi	250	4.4 mm	22 mm
EMK VA 160 CuNi	160	4.9 mm	24.5 mm

When bending, a minimum spacing of 20 mm must be maintained between the heating conductor/cold lead and sleeve/gland before the bend:

Bending radius Sleeve



Heating conductor side



Cross-section (mm^2)	**Cold lead diameter** (Ø)	**Minimum bending radius** (R)
2.5	4.9 mm	25
6.0	6.1 mm	31

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When installing, care must be taken to assure good surface contact and heat transmission. Heat-conductive material can be used to bridge critical points (edges or corners).

Before insulating, cover the heating circuit with aluminium or VA foil. On the one hand, this will improve the distribution of heat on the object and on the other hand it will protect against the penetration of insulating material between the heating circuit and the object to be heated. The presence of insulation parts between the heating circuit and the object increases temperatures in this area and can destroy the heating circuit. The user must check that the cover has been put on properly and correctly.

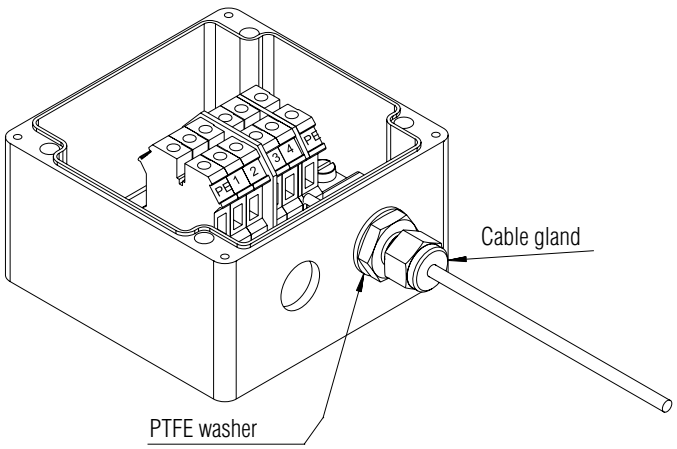
Metallic components which come into contact with the heating circuit must be integrated into the safety measures (protective earthing) required under Safety Class I. A more detailed explanation can be found in VDE 0100.

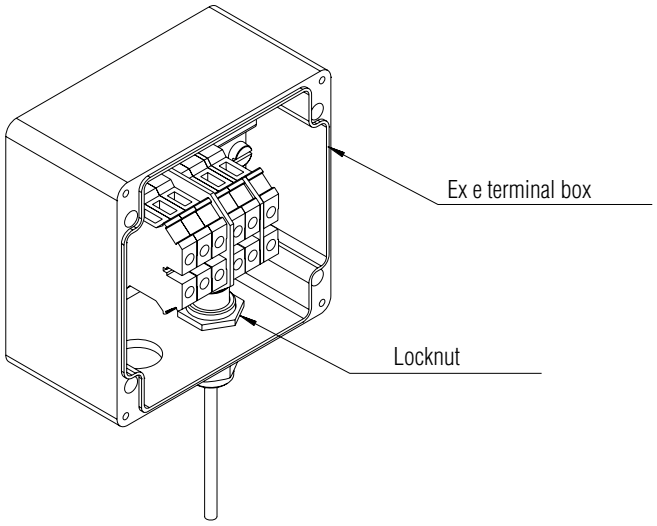
The cold leads are intended for fixed connection and are connected through glands with flexible connection strands into an Ex e/Ex d approved terminal box. The metallic outer sheath is earthed by means of the integrated protective earth conductor connection.

The glands are either screwed in through a suitable threaded hole in the terminal box or fixed in place by means of a through-hole and the included locknut.

When connecting, the requirements in the standards and regulations under “1. Safety Instructions” must be observed. The permissible temperature range in the connecting area is -55 °C to +70 °C.

The minimum permissible installation temperature is -55 °C.





Torques to tighten the gland and the washer:

Torque for the PTFE M20 and M25 washers: 20 Nm

Torque for the M20 gland: 30 Nm

Torque for the M25 gland: 35 Nm

Maximum permissible borehole diameter to enable the insertion of the cable glands into the terminal box:

Max. Ø 20.5 mm for M20 gland

Max. Ø 25.5 mm for M25 gland

5.4. Installation on fittings, flanges and pumps

- Always install the heating circuits on fittings, valves etc. in a way that ensures that they can be easily accessed and replaced during maintenance and repair work without there being a need to break up heating circuits. This is best achieved by ensuring that the heating cable loop is sufficiently large.
- The higher heat losses at fittings, valves etc. increase the length of heating circuit that is required. This additional requirement can be found in the project planning specifications.
- The heating circuits should be mounted so that the contact with the surface to be heated is as close as possible. Where such contact is not possible, for example on valves, suitable heat conducting cladding made of temperature-resistant metal foil or other heat-conducting materials may be used.

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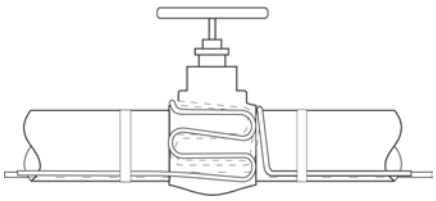
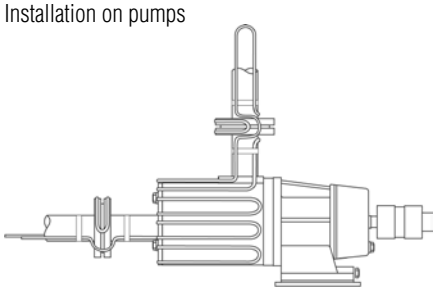
Typical types of installation are shown in the following illustrations:

Installation on valves

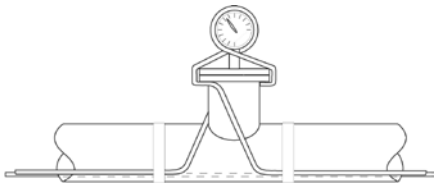


Installation on supports

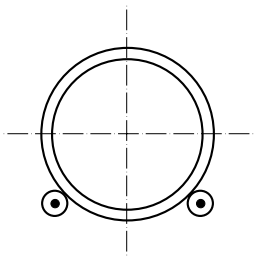
Installation on pumps



Installation on pressure gauges



5.5. Stretched Installation



When double laying the heating circuit, route along the"half-past four" and "half-past seven" positions on the pipe.

When installing on horizontal pipes, do not lay the heating circuit at the lowest point.

5.6. Installation

CAUTION

Disconnect all circuits before starting any installation or maintenance work. To switch off, all outer conductors, i.e. including the neutral conductor, must be disconnected from the power supply. It is essential to observe the markings on the heating circuit.

Note

- The supplied goods must be visually inspected and the insulation tested before installation. Check the markings on the heating circuits to ensure that they suit the ordered goods. Before and during installation: keep the heating cable and cold lead ends and also the trace heating connection components dry. Cable ends that are not connected must be closed off in the field using a suitable end termination.
- As a basic rule, the heating circuit must be affixed with mechanical and temperature stability to the workpiece to be heated to assure a reliable thermal coupling.
- The object provided with trace heating (workpiece, plant part) must be clearly marked as such, once the thermal insulation has been installed, by affixing warnings and markings at suitable points and/or at regular intervals along the heating circuit.
- After installation, the insulation must be tested.

NOTICE

For claims under guarantee it is essential to submit a correctly and fully completed acceptance test report.

BARTEC´s standard Acceptance Test Report can be found in the "Assembly and Operation of EKL/EMK installation systems"documentation (www.bartec.de).

6. Electric Protective Equipment

CAUTION

6.1. Overcurrent Protection

- *For overcurrent protection, please use only automatic circuit breakers which conform to the project planning and technical documents from BARTEC. Deviations from these can lead to false tripping of the automatic circuit breakers or impair the effectiveness of the overcurrent protection device.*
- *If protection units other than those specified in the project planning and BARTEC`s technical documents are to be used, please contact the technical department at BARTEC first.*

6.2. Residual Current operated Circuit-Breaker

- *It is recommendable to operate the heating circuits with a residual-current-operated circuit-breaker (RCCB). In this case, an RCCB with a tripping current of 0.3 or 0.5 A should be used as significant working currents can arise when the temperature is too high and the heating circuit too long.*
- *The heating circuits are suitable for use only in earthed networks such as TT or TN. Utilisation in insulated networks is not possible.*

7. Electrical Connection

CAUTION

- *Observe the nominal voltage specified in the marking on the heating circuit.*
- *Operate the respective heating circuit only with the nominal voltage intended for it, which is determined by the heating circuit design.*
- *When connecting the cold leads to external circuits, use enclosures and connection parts that are suitable for the respective application and have been installed correctly.*

8. Inspection and Commissioning

CAUTION

Both after installing the trace heating and also after installing the thermal insulation, the following inspections must be performed and recorded in a test report. This test data must be submitted whenever a complaint is made.

8.1. Measurement of the Insulation Resistance

- This test procedure serves to establish if there is any damage to the heating circuit and if any errors have been made when installing connections or links.
- An insulation tester with a minimum test voltage of DC 500 V and a maximum test voltage of DC 1000 V is used.

  The insulation resistance per heating circuit must be at least 20 MΩ (in conformance to EN 62395-1) irrespective of length.
- Performing the Measurement:
  - The measurements are taken between the heating conductor and the outer sheath.

8.2. Inspection of the Electric Protective Equipment

The requirements for protecting external circuits must be fulfilled. See "6. Electric Protective Equipment" in these instructions.

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8.3. Checking the Design Data

After switching on, it is important to check the specifications determined when the trace heating system was designed, such as applied voltage, the levels of current that arise and the pipe temperature, with the measures and devices appropriate for that purpose.

9. Operation, Maintenance, Upkeep

The owner/operating manager of an electric system must keep the operating equipment in good condition, operate it correctly in conformance to regulations, monitor it and do the required maintenance and repairs. Each piece of electric operating equipment must be selected for its suitability for use in the respective area.

Before starting operation again, check conformance to the applicable laws and directives. The specified safety instructions must be observed before starting maintenance work or troubleshooting.

⚠ WARNING

The heating circuit can reach temperatures during operation which will cause burning when touched. This is why the heating circuit must not be touched when switched on. Suitable measures must be taken to protect people.

9.1. Troubleshooting

Special troubleshooting procedures are helpful in the detection of faults in electric trace heating systems installed under the thermal insulation.

In addition, the engineer who planned the electric trace heating systems should be consulted. Faults are often caused by mechanical damage, corrosion, overheating or the penetration of moisture. The inspections required before commissioning should be repeated as a basis for locating the fault(s)..

9.2. Repairs, Servicing

The maintenance and repairs are performed in accordance with the standards and conditions specified under point “3. Marking and Safety Instructions” and, depending on the utilisation, the applicable rules laid down by the employers’ liability insurance association (BG) and other conditions relating to the respective application. The heating equipment and its regulation should be tested for correct functioning at least once a year.

10. Approvals and Ex Protection Type Marking

EC Type Examination Certificate	BVS 13 ATEX E 034 U
ATEX Marking	Ⓔx II 2 G Ex e IIC Gb Ⓔx II 2 D Ex tb IIIC Db
IECEx Certificate of Conformity	IECEx BVS 13.0042U
IECEx Marking	Ex e IIC Gb Ex tb IIIC Db
Applied Standards	EN 60079-0:2009 IEC 60079-0:2007-10 EN 60079-7:2007 IEC 60079-7:2006-07 EN 60079-30-1:2007 IEC 60079-30-1:2007-01 EN 60079-31:2009 IEC 60079-31:2008

11. Technical Data

Operating Voltage	up to AC 500 V
Nominal current	with cold lead 2.5 mm² up to 30 A with cold lead 6,0 mm² up to 55 A
Resistance	Heating cable 160 Ω/km up to 10 kΩ/km Cold lead 3 Ω/km up to 7 Ω/km
Minimum bending radius	5 x conductor diameter
Permissible operating temperature	Cable terminations -55 °C up to +70 °C Cables -70 °C up to +650 °C
Minimum installation temperature	-55 °C

12. Service Address

BARTEC GmbH
Max-Eyth-Straße 16
97980 Bad Mergentheim
Germany

Phone: +49 7931 597-0
Fax: +49 7931 597-183
info.bartec.de
www.bartec-group.com

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Declaration of Conformity

Erklärung der Konformität
Declaration of Conformity
Attestation de conformité

Nº 21-3641-7C0001

BARTEC GmbH
Max-Eyth-Straße 16
97980 Bad Mergentheim
Germany

Wir	We	Nous
BARTEC GmbH,		
erklären in alleiniger Verantwortung, dass das Produkt	declare under our sole responsibility that the product	attestons sous notre seule responsabilité que le produit
EMK Heizkreis Ex	**EMK heating circuit Ex**	**EMK circuit de chauffage Ex**
	Typ 27-3641-*2/**** **	
auf das sich diese Erklärung bezieht den Anforderungen der folgenden **Richtlinien (RL)** entspricht	to which this declaration relates is in accordance with the provision of the following **directives (D)**	se référant à cette attestation correspond aux dispositions des **directives (D)** suivantes
ATEX-Richtlinie 94/9/EG	**ATEX-Directive 94/9/EC**	**ATEX-Directive 94/9/CE**
und mit folgenden Normen oder normativen Dokumenten übereinstimmt	and is in conformity with the following standards or other normative documents	et est conforme aux normes ou documents normatifs ci-dessous
EN 60079-0:2009 **EN 60079-7:2007** **EN 60079-30-1:2007** **EN 60079-31:2009**		
Kennzeichnung	**Marking**	**Marquage**
II 2 G Ex e IIC Gb **II 2 D Ex tb IIIC Db**		
Verfahren der EG-Baumusterprüfung / Benannte Stelle	**Procedure of EC-Type Examination / Notified Body**	**Procédure d'examen CE de type / Organisme Notifié**
BVS 13 ATEX E 034 U **0158, DEKRA EXAM, Dinnendahlstrasse 9, 44809 Bochum, D** **0044**		

Bad Mergentheim, den 29.05.2013

ppa. Ewald Warmuth
Geschäftsleitung / General Manager

03-0383-0289

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